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PREP SECTION

## Memorandum

Date . September 29, 1989

From Toxicologist  
Emergency Response Branch, Office of Health Assessment, ATSDRSubject Health Consultation: Monsanto Agricultural Company, J. F. Queeny Plant,  
St. Louis, MissouriTo Mr. Daniel Harper  
Public Health Advisor  
EPA Region VII  
Kansas City, Kansas

Through: Chief, Emergency Response Branch, DHAC, ATSDR \_\_\_\_\_

STATEMENT OF PROBLEM

The Monsanto Agricultural Company, J. F. Queeny Plant in St Louis, Missouri has a waste incinerator that burns a waste stream containing chlorinated compounds. The flu gas from this incinerator contains chlorine. The Environmental Protection Agency has completed a computer simulation for the spatial distribution of chlorine around the stack. This model used actual stack discharge values and meteorological data for the 5 year period 1973 through 1977. The EPA provided the ATSDR with model calculations for the maximum annual average, 1-hour, and 24-hour concentrations and their spatial relationship to the stack. The EPA requested the Agency for Toxic Substances and Disease Registry to evaluate the predicted concentrations with regard to acceptable human exposure to chlorine gas in the ambient air.

DOCUMENTS REVIEWED

1. Memorandum, Michael J. Sanderson, RCRA Branch Chief, EPA, to Daniel Harper, ATSDR, undated.
2. Memorandum, Richard L. Daye, Air Planning and Development Section, EPA, to John Smith, RCRA, EPA, with attachments September 6, 1989.
3. Preliminary Draft, "Health Assessment Document for Chlorine and Hydrogen Chloride," Dynamac Corporation, March 20, 1987.
4. "Emergency Response Planning Guidelines," American Industrial Hygiene Association, April 20, 1988.
5. Occupational Safety and Health Administration, Rules and Regulations, Federal Register, Vol 54, p 2444, 2445, 2455, and 2456, January 1989.



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6. Reference Dose (RfD) Description and Use in Health Risk assessments, EPA, undated.
7. "IRIS File, Nitric Oxide," EPA.

#### CONTAMINANTS AND PATHWAYS

The contaminant modeled by EPA was chlorine. The EPA did not provide any data showing the presence of other contaminants in the stack gas for this plant. The ATSDR recently reviewed data from another Monsanto plant burning the same wastes. The stack sample data from that plant included results for hydrochloric acid, 1,2-DCE (1,2-dichloroethene), PERC (tetrachloroethene), and MCB (monochlorobenzene). Thus, this plant probably has these same chemicals and perhaps others in its incinerator discharge. At the other plant chlorine was the chemical of primary concern because of its concentration and toxicity. This is very likely the case for this site also. The only route of exposure for the public to these chemicals is by the air pathway.

#### DISCUSSION

The ATSDR has no information on what chemicals, in addition to chlorine are present in the stack gas from this site. Given the information from the other plant, burning the same waste, chlorine is very likely the pollutant of primary concern in the stack gas discharged from this incinerator.

The EPA air model using the data from the incinerator test with the highest burn rate and the worst case meteorological conditions gave maximum annual average chlorine concentration of  $6.9 \text{ ug/m}^3$  and a maximum 1-hour concentration of  $295 \text{ ug/m}^3$ . The model predicts that the maximum annual average would occur 50 meters from the stack with a bearing of 130 degrees. The predicted location for the maximum 1-hour concentration is 75 feet from the stack at a bearing of 140 degrees. These locations are both less than 50 meters from the Union Pacific building.

Both the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for chlorine is  $1500 \text{ ug/m}^3$  and a Short-term Exposure Limit (STEL) of  $3000 \text{ ug/m}^3$ . The National Institute for Occupational Safety and Health (NIOSH) recommended in its criteria document a limit of  $1,500 \text{ ug/m}^3$  measured over 15 minutes. OSHA in its January 1989 revision to its chlorine PEL and STEL state:

" . . . that an exposure limit of  $1.5 \text{ mg/m}^3$  TWA with a  $3 \text{ mg/m}^3/15$  minute STEL will reduce the risk of irritation and pulmonary function decline in workers, . . . "

This shows that OSHA believes there are data showing that long-term 1 time exposure to the previous PEL and STEL concentrations did cause respiratory irritation and the decline in pulmonary function for workers.

Animal studies exposing 20 rats per group to 1, 3, and 9 ppm (2,900, 8,700, and 26,100  $\text{ug}/\text{m}^3$ ) for six hours per day five days per week for only six weeks showed pathological and clinical changes in the 3 and 9 ppm animals. The animals in the higher exposure groups also experienced significant decreases in body weight. The highest exposure group showed inflammation of the upper and/or lower respiratory tract. The investigation showed that the animals in the two groups exposed to the lower concentrations also experienced the same inflammation but to a lesser extent.

Human studies published in 1983 have shown that 8-hour exposures to chlorine of 0.5 ppm (1,450  $\text{ug}/\text{m}^3$ ) was acceptable with no discomfort. When the chlorine concentration was 1 ppm (2,900  $\text{ug}/\text{m}^3$ ), the human subjects experienced some throat irritation from an 8-hour exposure. Older literature concerning human exposure showed irritation at lower chlorine concentrations. However, because of apparent methodological shortcomings in those studies, OSHA based its rule making on the more recent studies. This decision shows that OSHA believes the recent study results more accurately describes the human response to these levels of chlorine in air than do the older studies.

#### CONCLUSIONS AND RECOMMENDATIONS

The EPA air model predicts that the highest concentrations will occur off-site on the property of Union Pacific. Because of this the ATSDR believes that the STEL divided by 10 (300  $\text{ug}/\text{m}^3$ ) is an appropriate guideline for the maximum 1-hour chlorine concentration at this site. The model predicted maximum 1-hour chlorine concentration of 295  $\text{ug}/\text{m}^3$  essentially equal to this guidance value. Because of this the ATSDR believes that real-time monitoring is necessary to validate the model. The ATSDR believes that this will protect the public from excessive exposure to chlorine.

The ATSDR believes that a guidance value for the annual average concentration should not exceed the workplace PEL/TLV divided by 150. This would give 10  $\text{ug}/\text{m}^3$  as a guidance value for this site. The model predicted maximum annual average of 6.9  $\text{ug}/\text{m}^3$  is less than this guidance value.

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A malfunctioning incinerator could release even greater quantities of chlorine than those measured in the short-term test. Under such conditions employees at other portions of this facility, those of Union Pacific, and the general public might receive excessive exposure to chlorine. Thus, it would behoove the operator of the facility to continuously monitor chlorine in the flu gas. When the chlorine concentration in the flu gas exceeds those used in the EPA model calculations they should immediately correct the problem.

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